## Abstract of the Disclosure

A microtiter plate-based assay method requiring no radioactivity and that enables automated assays of DNA oxidative stress. A disclosed method, directly and completely on the microtiter plate, comprises binding DNA to microtiter plate, reacting abasic (AP) sites of DNA with a chemical reagent (aldehyde reactive probe (ARP)), and performing a biotin avidin horseradish peroxidase technique to tag ARP with a biotin residue for subsequent colorimetric analysis. Reacting may be performed on DNA cells in culture. Binding may use Reacti-bind, which is an Aldehyde-Reactive-Probe. Colorimetric analysis may be performed using an avidin-biotin conjugated mechanism to quantify the tagged abasic (AP) sites in DNA. Also disclosed is a procedure to assay modified bases in genomic DNA by enzymatic digestion using an N-glycosylase enzyme such as endonuclease-III, 8-oxoguanine glycosylase [yOOG1], human 8-oxoguanine glycosylase [hOGG1], and/or an FPG protein to indicate repair capacity. The invention enables automation of DNA assays for large population studies, as well as portable hand-held devices for quantitating DNA damage and repair capacity.